WHAT IS CLAIMED IS:

1. A composition comprising a liquid crystal dispersed within a polymer matrix, the polymer matrix formed by the cross-linking of a polyacrylate resin and a polyisocyanate resin, the liquid crystal exhibiting a minimum bulk resistivity of 1×10^{12} ohm.cm and a voltage holding ratio (VHR) of 98% or greater.

2. The composition of claim 1 wherein the ratio of liquid crystal to polymer is between about 50/50 and 70/30 (wt/wt).

3. The composition of claim 1 exhibiting a driving voltage of 280 V or less across an air gap of at least 15 μm.

4. The composition of claim 1 wherein the polyacrylate resin contains hydroxyl groups which can be used for cross-linking.

5. The composition of claim 1 wherein the liquid crystal is selected from the TL series available from EM Industries.

6. A method of detecting defective operation of an electro-optical device, the method comprising:

disposing a polymer dispersed liquid crystal (PDLC) overlying and separated from an underlying electro-optical device by an air gap, the PDLC having a polymer matrix formed by the cross-linking of a polyacrylate resin and a polyisocyanate resin, and having a liquid crystal exhibiting a minimum bulk resistivity of 1×10^{12} ohm.cm and a voltage holding ratio (VHR) of 98% or greater;

applying a voltage to a transparent electrode overlying the PDLC while illuminating the PDLC; and

detecting a changed intensity of light transmitted by the PDLC.

7. The method of claim 6 wherein the PDLC is disposed over a glass substrate bearing a thin film transistor.

8. The method of claim 6 wherein the changed intensity of light is detected by reflection of the incident light by a mirror.

9. The method of claim 6 wherein the PDLC comprises a ratio of liquid crystal to polymer of between about 50/50 and 70/30 (wt/wt).

10. The method of claim 6 wherein the applied voltage is between about 100-320 V across an air gap of at least 5 μm.

11. The method of claim 6 wherein the polyacrylate resin is selected from the group consisting of Paraloid AU1033 available from Rohm and Haas, and Doresco TA45-8 or Doresco TA65-1 available from Dock Resins.

12. The method of claim 6 wherein the polyisocyanate resin comprises an aliphatic polyisocyanate such as Desmodur N-75 from Bayer Polymers.

13. The method of claim 6 wherein the liquid crystal is selected from the TL series available from EM Industries.

14. An apparatus for inspecting a semiconductor device, the apparatus comprising:

a support for a semiconductor device;

an electro-optic modulator separated from the support by an air gap, the electro-optic modulator comprising,

a mirror disposed proximate to the support,

a transparent electrode distal from the support, and

a polymer dispersed liquid crystal (PDLC) sensor material disposed between the transparent electrode and the mirror, the PDLC having a polymer matrix formed by the cross-linking of a polyacrylate resin and a polyisocyanate resin, and a liquid crystal exhibiting a minimum bulk resistivity of 1×10^{12} ohm.cm and a voltage holding ratio (VHR) of 98% or greater;

a light source configured to illuminate the PDLC material during application of a voltage to the transparent electrode; and

a detector configured to detect intensity of light reflected by the mirror.

15. The apparatus of claim 14 wherein the support comprises a support for a workpiece bearing a thin film transistor.

16. The apparatus of claim 14 wherein the air gap has a width of between about 5-30 μm, and a voltage of about 100-320 V is configured to be applied to the transparent electrode.

17. The apparatus of claim 14 wherein the liquid crystal is selected from the TL series available from EM Industries.